

# MBR40H100WT

## SWITCHMODE™ Power Rectifier 100 V, 40 A

### Features and Benefits

- Low Forward Voltage
- Low Power Loss/High Efficiency
- High Surge Capacity
- 175°C Operating Junction Temperature
- 40 A Total (20 A Per Diode Leg)
- This is a Pb-Free Device

### Applications

- Power Supply – Output Rectification
- Power Management
- Instrumentation

### Mechanical Characteristics:

- Case: Epoxy, Molded
- Epoxy Meets UL 94 V-0 @ 0.125 in
- Weight: 4.3 Grams (Approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes: 260°C Max. for 10 Seconds

### MAXIMUM RATINGS

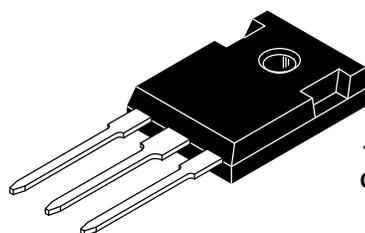
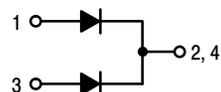
Please See the Table on the Following Page



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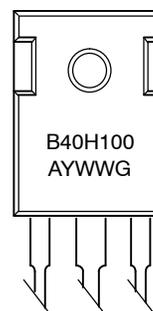
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### SCHOTTKY BARRIER RECTIFIER 40 AMPERES 100 VOLTS



TO-247AC  
CASE 340L  
STYLE 2

### MARKING DIAGRAM



B40H100 = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

| Device       | Package             | Shipping      |
|--------------|---------------------|---------------|
| MBR40H100WTG | TO-247<br>(Pb-Free) | 30 Units/Rail |

# MBR40H100WT

## MAXIMUM RATINGS (Per Diode Leg)

| Rating   | Symbol                          | Value           | Unit             |
|--|---------------------------------|-----------------|------------------|
| Peak Repetitive Reverse Voltage<br>Working Peak Reverse Voltage<br>DC Blocking Voltage                     | $V_{RRM}$<br>$V_{RWM}$<br>$V_R$ | 100             | V                |
| Average Rectified Forward Current<br>$T_C = 148^\circ\text{C}$ , per Diode<br>per Device                   | $I_{F(AV)}$                     | 20<br>40        | A                |
| Peak Repetitive Forward Current<br>(Square Wave, 20 kHz) $T_C = 144^\circ\text{C}$                         | $I_{FRM}$                       | 40              | A                |
| Nonrepetitive Peak Surge Current<br>(Surge applied at rated load conditions halfwave, single phase, 60 Hz) | $I_{FSM}$                       | 200             | A                |
| Operating Junction Temperature (Note 1)  | $T_J$                           | +175            | $^\circ\text{C}$ |
| Storage Temperature  | $T_{stg}$                       | -65 to +175     | $^\circ\text{C}$ |
| Voltage Rate of Change (Rated $V_R$ )  | dv/dt                           | 10,000          | V/ $\mu\text{s}$ |
| Controlled Avalanche Energy (see test conditions in Figures 10 and 11)                                     | $W_{AVAIL}$                     | 400             | mJ               |
| ESD Ratings: Machine Model = C<br>Human Body Model = 3B  |                                 | > 400<br>> 8000 | V                |

## THERMAL CHARACTERISTICS

|   |                                    |            |                           |
|---|------------------------------------|------------|---------------------------|
| Maximum Thermal Resistance – Junction-to-Case<br>– Junction-to-Ambient (Socket Mounted) | $R_{\theta JC}$<br>$R_{\theta JA}$ | 0.58<br>32 | $^\circ\text{C}/\text{W}$ |
|---|------------------------------------|------------|---------------------------|

## ELECTRICAL CHARACTERISTICS

| Characterisitic  | Symbol | Min | Typ                          | Max                          | Unit |
|--|--------|-----|------------------------------|------------------------------|------|
| Instantaneous Forward Voltage (Note 2)<br>( $I_F = 20\text{ A}$ , $T_J = 25^\circ\text{C}$ )<br>( $I_F = 20\text{ A}$ , $T_J = 125^\circ\text{C}$ )<br>( $I_F = 40\text{ A}$ , $T_J = 25^\circ\text{C}$ )<br>( $I_F = 40\text{ A}$ , $T_J = 125^\circ\text{C}$ ) | $v_F$  | -   | 0.74<br>0.61<br>0.85<br>0.72 | 0.80<br>0.67<br>0.90<br>0.76 | V    |
| Instantaneous Reverse Current (Note 2)<br>(Rated dc Voltage, $T_J = 125^\circ\text{C}$ )<br>(Rated dc Voltage, $T_J = 25^\circ\text{C}$ )  | $i_R$  | -   | 2.0<br>0.0012                | 10<br>0.01                   | mA   |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

- The heat generated must be less than the thermal conductivity from Junction-to-Ambient:  $dP_D/dT_J < 1/R_{\theta JA}$ .
- Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

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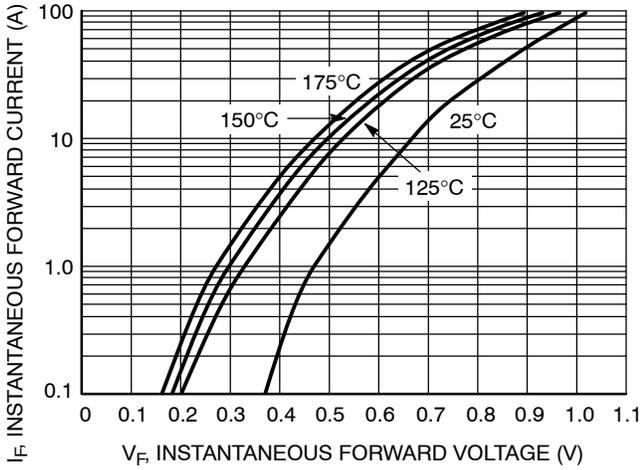


Figure 1. Typical Forward Voltage

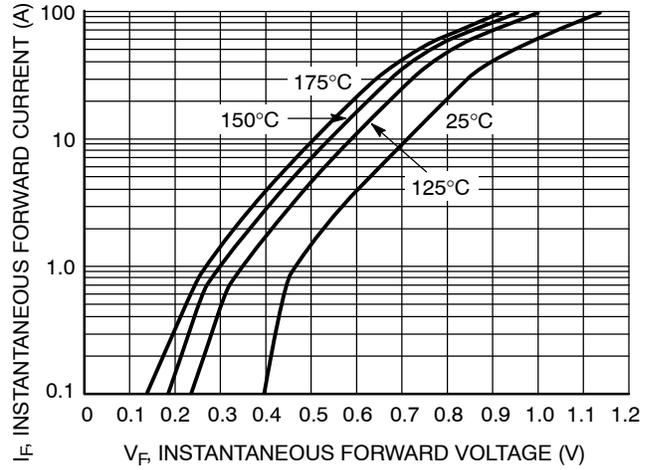


Figure 2. Maximum Forward Voltage

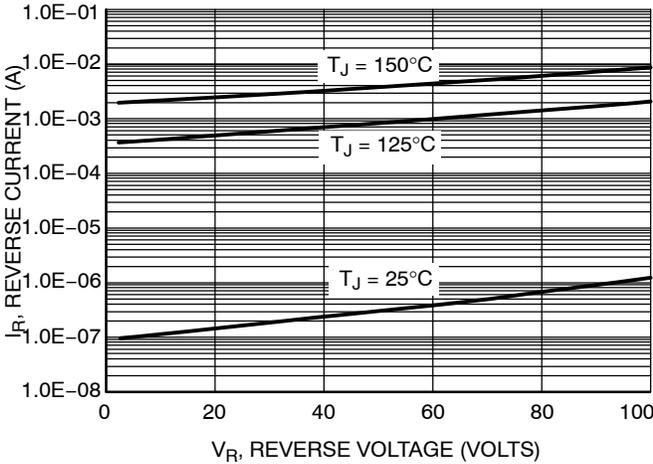


Figure 3. Typical Reverse Current

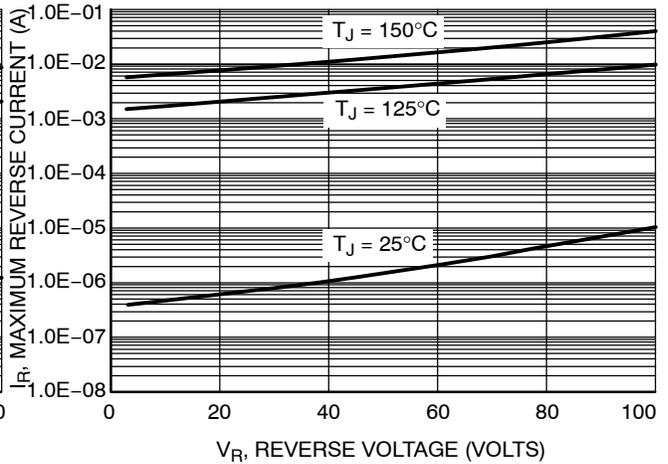


Figure 4. Maximum Reverse Current

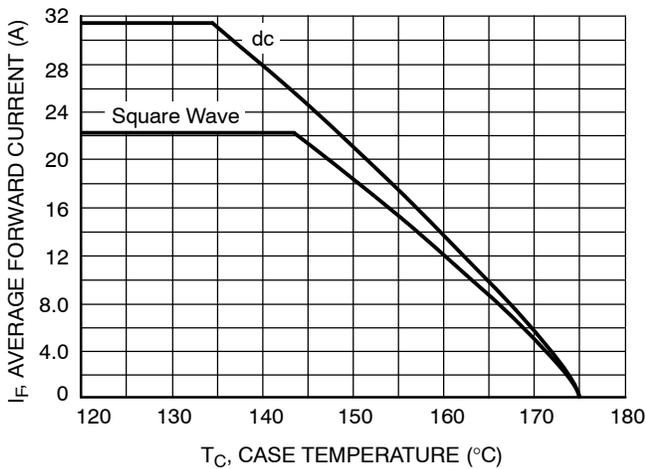


Figure 5. Current Derating, Case, Per Leg

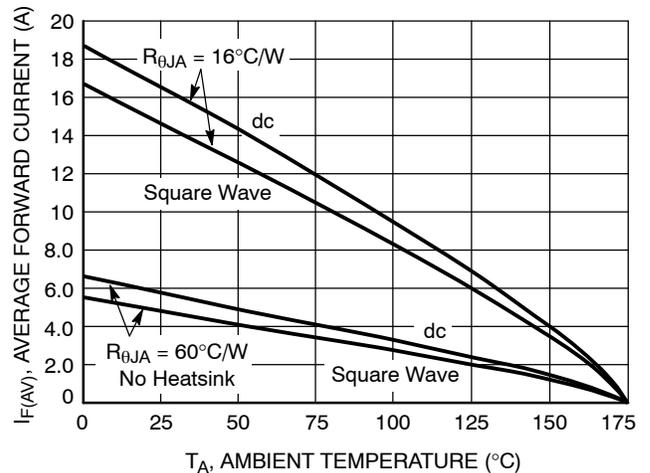


Figure 6. Current Derating, Ambient, Per Leg

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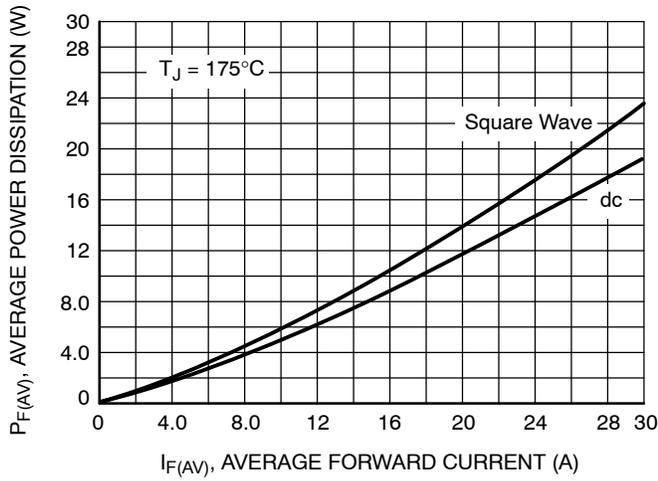


Figure 7. Forward Power Dissipation

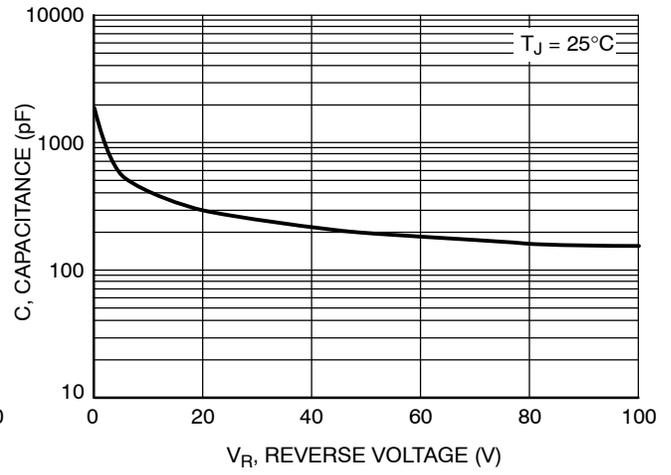


Figure 8. Capacitance

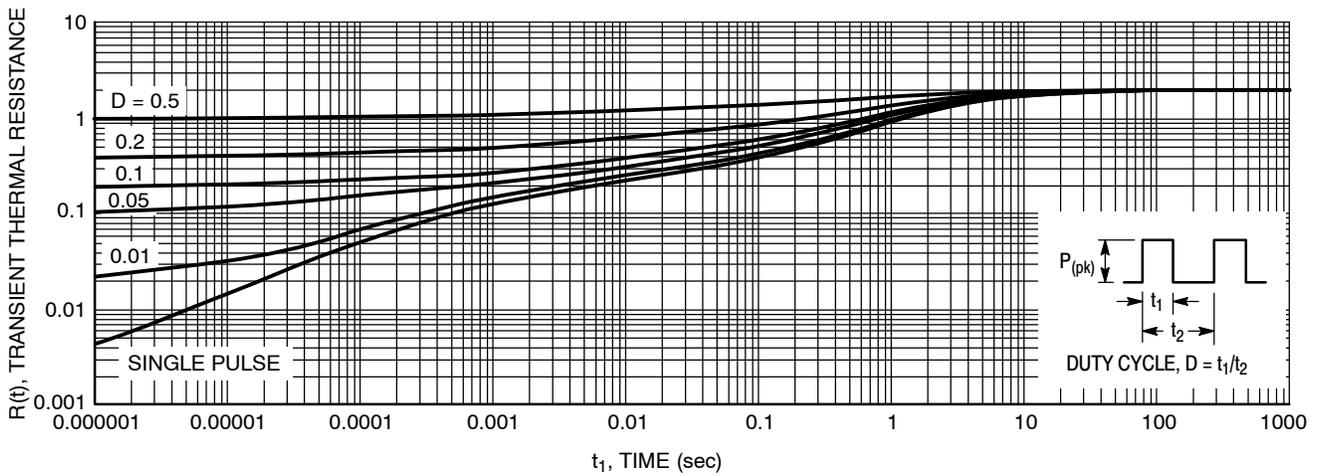


Figure 9. Thermal Response Junction-to-Case

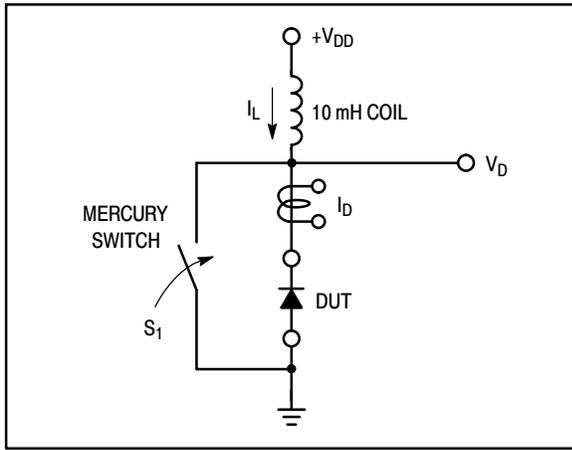


Figure 10. Test Circuit

The unclamped inductive switching circuit shown in Figure 10 was used to demonstrate the controlled avalanche capability of this device. A mercury switch was used instead of an electronic switch to simulate a noisy environment when the switch was being opened.

When  $S_1$  is closed at  $t_0$  the current in the inductor  $I_L$  ramps up linearly; and energy is stored in the coil. At  $t_1$  the switch is opened and the voltage across the diode under test begins to rise rapidly, due to  $di/dt$  effects, when this induced voltage reaches the breakdown voltage of the diode, it is clamped at  $BV_{DUT}$  and the diode begins to conduct the full load current which now starts to decay linearly through the diode, and goes to zero at  $t_2$ .

By solving the loop equation at the point in time when  $S_1$  is opened; and calculating the energy that is transferred to the diode it can be shown that the total energy transferred is equal to the energy stored in the inductor plus a finite amount of energy from the  $V_{DD}$  power supply while the diode is in breakdown (from  $t_1$  to  $t_2$ ) minus any losses due to finite component resistances. Assuming the component resistive

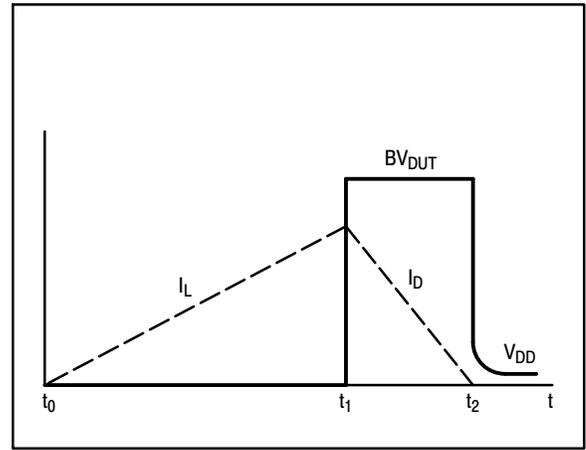


Figure 11. Current-Voltage Waveforms

elements are small Equation (1) approximates the total energy transferred to the diode. It can be seen from this equation that if the  $V_{DD}$  voltage is low compared to the breakdown voltage of the device, the amount of energy contributed by the supply during breakdown is small and the total energy can be assumed to be nearly equal to the energy stored in the coil during the time when  $S_1$  was closed, Equation (2).

EQUATION (1):

$$W_{AVAL} \approx \frac{1}{2} L I_{LPK}^2 \left( \frac{BV_{DUT}}{BV_{DUT} - V_{DD}} \right)$$

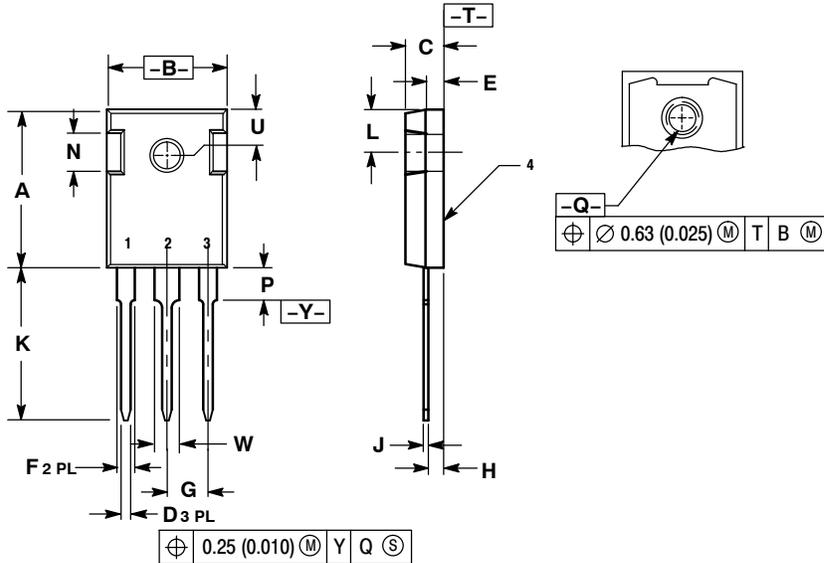
EQUATION (2):

$$W_{AVAL} \approx \frac{1}{2} L I_{LPK}^2$$

# MBR40H100WT

## PACKAGE DIMENSIONS

TO-247  
CASE 340L-02  
ISSUE E



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 20.32       | 21.08 | 0.800     | 0.830 |
| B   | 15.75       | 16.26 | 0.620     | 0.640 |
| C   | 4.70        | 5.30  | 0.185     | 0.209 |
| D   | 1.00        | 1.40  | 0.040     | 0.055 |
| E   | 1.90        | 2.60  | 0.075     | 0.102 |
| F   | 1.65        | 2.13  | 0.065     | 0.084 |
| G   | 5.45 BSC    |       | 0.215 BSC |       |
| H   | 1.50        | 2.49  | 0.059     | 0.098 |
| J   | 0.40        | 0.80  | 0.016     | 0.031 |
| K   | 19.81       | 20.83 | 0.780     | 0.820 |
| L   | 5.40        | 6.20  | 0.212     | 0.244 |
| N   | 4.32        | 5.49  | 0.170     | 0.216 |
| P   | ---         | 4.50  | ---       | 0.177 |
| Q   | 3.55        | 3.65  | 0.140     | 0.144 |
| U   | 6.15 BSC    |       | 0.242 BSC |       |
| W   | 2.87        | 3.12  | 0.113     | 0.123 |

STYLE 2:

1. ANODE
2. CATHODE (S)
3. ANODE 2
4. CATHODES (S)

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